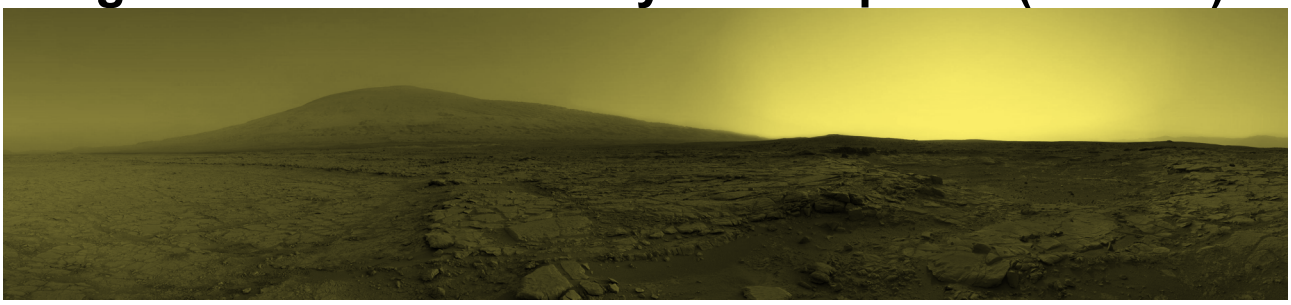
National Aeronautics and Space Administration

Long-Lived In-Situ Solar System Explorer (LLISSE)



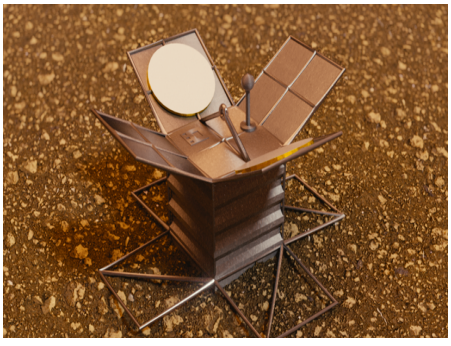
Visual of Venus Surface Conditions

NASAfacts

LLISSE Overview

Exploration to better understand the deep Venus atmosphere and surface is a long-standing objective of the Venus science community as stated in Venus Exploration Analysis Group (VEXAG) documents and the Planetary Decadal Survey Report. The extremely hostile environmental conditions at the surface of Venus, coupled with thick, acidic clouds and dense atmosphere, have made achieving Venus surface science objectives very challenging. For the last several decades, the ability of instruments to survive on the surface of Venus and do in-situ science was limited in duration to hours. Recent technology advances in high-temperature electronics and the addition of new capabilities to simulate Venus conditions, such as provided by the Glenn Extreme Environment Rig (GEER), are changing this paradigm.

LLISSE is a probe concept designed to address Venus science questions with simple sensors, electronics, and communications package. Given its small volume and expected low mass (10 kg), LLISSE could be paired with a communications orbiter, or delivered to Venus as a secondary payload. It may alternatively be delivered as a suite of probes packaged in a dedicated protective aeroshell. LLISSE will not only make important scientific measurements but will also establish a technological heritage for instruments and infrastructure for future Venus exploration.



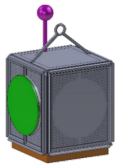
LLISSE Probe Concept

Science Objectives	Anticipated Instruments/ Measurement
Estimate the moment exchange between the planet and its atmosphere	Wind speed and direction, temperature, and pressure
Acquire temporal data to update global circulation models	Winds, temperature, pressure, and chemical composition
Quantify near surface atmospheric chemistry variability	Chemical composition, temperature, pressure, and winds
Technology demonstration for more capable future lander missions	All

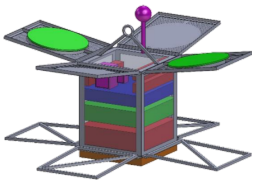
Current LLISSE Approach

The battery powered prototype probe is shown below in both the un-deployed and deployed state. LLISSE is an approximately 20 cm cube in the un-deployed state, and when deployed has drag flaps that aid in the probe descent through the Venus atmosphere. A battery capable of providing power for long duration (~ 60 Earth days) on the surface of Venus is in development.

The LLISSE probe will periodically collect and communicate, measurements of temperature, pressure, solar radiance, wind velocity and direction, and chemical composition to a Venus orbiter. The data will be used to develop a better understanding of the physics and chemistry of the Venus atmosphere, to determine the dynamic processes occurring between the Venus surface and atmosphere, and to better understand the climate and chemical cycles.



~ 20 cm cube



Conceptual LLISSE Battery Prototype

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